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EXAMINER

YIGDALL, MICHAEL J

ART UNIT	PAPER NUMBER
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2122

DATE MAILED: 04/02/2004

3

Please find below and/or attached an Office communication concerning this application or proceeding.

7

Office Action Summary

Application No.

09/964,763

Applicant(s)

ROBISON, ARCH D.

Examiner

Michael J. Yigdall

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 September 2001.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-26 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 September 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 2.
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____

DETAILED ACTION

1. Claims 1-26 are pending and have been examined. The priority date considered for the application is 27 September 2001.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Pat. No. 6,173,444 to Archambault in view of U.S. Pat. No. 6,045,585 to Blainey.

With respect to claim 1, Archambault discloses a method comprising:

(a) receiving a code segment having a plurality of instructions, the code segment having an outer scope and a number of inner scopes, wherein the plurality of instructions comprise a number of pointers (see column 5, lines 4-17, which shows receiving program code having a number of functions, i.e. a number of inner scopes within the outer scope of the program, and a plurality of instructions comprising a number of pointers).

Although Archambault discloses pointer variables in the C programming language (see column 4, lines 13-15), Archambault does not expressly disclose the limitation wherein at least one of the number of pointers is restricted.

However, Blainey discloses obtaining precise alias information using language rules, language features, and programmer assertions (see column 2, lines 40-46), in a system for optimizing a program by determining the aliases among compilation units (see column 3, lines 26-29). Note that restricted pointers are considered a language feature that enables a particular programmer assertion.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include support for restricted pointers in the Archambault system, for the purpose of easily obtaining precise alias information in the early stages of compilation, as taught by Blainey (see Blainey, column 2, lines 40-53).

Archambault further discloses:

(b) determining, within one of the number of inner scopes, whether at least two pointers of the number of pointers are aliases (see column 5, lines 4-17, which shows building an alias graph for each function or scope by determining the alias sets of the pointers, i.e. by determining whether the pointers are aliases).

With respect to claim 2, Archambault further discloses determining a base pointer for each pointer of the number of pointers (see column 5, lines 4-17, which shows determining a base pointer for each pointer definition comprising the right-hand side of its associated variable assignment operation).

With respect to claim 3, Archambault further discloses the limitation wherein the determining a base pointer for each pointer of the number of pointers comprises grouping pointers together upon determining that the pointers are copied to a pointer that is not a restricted

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pointer (see column 6, lines 16-46, which shows finding the union of alias sets and propagating transitive relationships to group pointers together, when appropriate, such as when pointers are copied to a non-restricted pointer).

With respect to claim 4, Archambault further discloses the limitation wherein there is no grouping of pointers when the pointers have distinct base pointers (see column 5, lines 31-41, which shows adding new nodes to the pointer graph, i.e. not grouping the pointers into an alias set, when the base pointers are distinct and thus not already represented in the graph).

With respect to claim 5, Archambault further discloses, for each instruction of the plurality of instructions that accesses a pointer, determining which at least one restricted pointer is within the scope of the pointer when the pointer is accessed (see column 5, lines 52-56, which shows determining the pointer variables accessed in the local scope).

With respect to claim 6, Archambault further discloses the limitation wherein the determining, within one of the number of inner scopes, whether at least two pointers of the number of pointers are aliases is based on the base pointer for each of the number of pointers (see column 6, lines 61-67, which shows that alias sets are determined based on the L-value, i.e. the memory address or base pointer).

With respect to claim 7 Archambault further discloses the limitation wherein the determining, within one of the number of inner scopes, whether at least two pointers of the number of pointers are aliases is based on, for each instruction of the plurality of instructions that accesses the pointer, which at least one restricted pointer is within the scope of the pointer, when

the pointer is accessed (see column 5, lines 52-56, which shows determining the alias sets for all pointer variables accessed in the local scope).

With respect to claim 8, Archambault discloses a method comprising:

(a) receiving a code segment having a plurality of instructions, wherein the plurality of instructions comprise a number of pointers (see column 5, lines 4-17, which shows receiving program code having a plurality of instructions comprising a number of pointers).

Although Archambault discloses pointer variables in the C programming language (see column 4, lines 13-15), Archambault does not expressly disclose the limitation wherein at least one of the number of pointers is restricted.

However, Blainey discloses obtaining precise alias information using language rules, language features, and programmer assertions (see column 2, lines 40-46), in a system for optimizing a program by determining the aliases among compilation units (see column 3, lines 26-29). Note that restricted pointers are considered a language feature that enables a particular programmer assertion.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include support for restricted pointers in the Archambault system, for the purpose of easily obtaining precise alias information in the early stages of compilation, as taught by Blainey (see Blainey, column 2, lines 40-53).

Archambault further discloses the limitation wherein the at least one restricted pointer is in-scope or out-of-scope (see column 5, lines 18-23 and 52-56, which show different levels of scope; note that a pointer would be considered either in or out of scope); and

(b) determining whether at least two pointers of the number of pointers are aliases when each pointer of the at least two pointers is out-of-scope relative to the other pointers of the at least two pointers (see column 5, lines 4-17, which shows determining whether pointers are aliases by defining the alias sets of pointers in a given function or scope, i.e. of pointers that are out of scope relative to other pointers).

With respect to claim 9, Archambault further discloses determining a base pointer for each pointer of the number of pointers (see column 5, lines 4-17, which shows determining a base pointer for each pointer definition comprising the right-hand side of its associated variable assignment operation).

With respect to claim 10, Archambault further discloses determining, for each pointer of the number of pointers, whether each at least one restricted pointer is in-scope when the pointer of the number of pointers is accessed (see column 5, lines 52-56, which shows determining the pointer variables accessed in the local scope).

With respect to claim 11, Archambault further discloses the limitation wherein the determining whether at least two pointers of the number of pointers are aliases is based on determining a base pointer for each pointer of the number of pointers (see column 6, lines 61-67, which shows that alias sets are determined based on the L-value, i.e. the memory address or base pointer).

With respect to claim 12, Archambault further discloses the limitation wherein the determining whether at least two pointers of the number of pointers are aliases is based on

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determining a base pointer for each pointer of the number of pointers (see column 6, lines 61-67, which shows that alias sets are determined based on the L-value, i.e. the memory address or base pointer), and on determining for each pointer of the number of pointers whether each at least one restricted pointer is in-scope when the pointer is accessed (see column 5, lines 52-56, which shows determining the pointer variables accessed in the local scope).

With respect to claim 13, see the explanation for claim 1 set forth above. Claim 13 is a system claim that recites limitations analogous to those recited in method claim 1. Note that Archambault further discloses a compiler coupled to a memory unit (see column 3, lines 12-18).

With respect to claim 14, see the explanation for claim 2 set forth above.

With respect to claim 15, see the explanation for claim 5 set forth above.

With respect to claim 16, see the explanation for claim 7 set forth above.

With respect to claim 17, see the explanation for claim 1 set forth above. Claim 17 is a product claim that recites limitations analogous to those recited in method claim 1. Note that Archambault further discloses a machine-readable medium that provides instructions to be executed by a machine (see column 3, lines 36-40).

With respect to claim 18, see the explanation for claim 2 set forth above.

With respect to claim 19, see the explanation for claim 5 set forth above.

With respect to claim 20, see the explanation for claim 6 set forth above.

With respect to claim 21, see the explanation for claim 7 set forth above.

With respect to claim 22, see the explanation for claim 8 set forth above. Claim 17 is a product claim that recites limitations analogous to those recited in method claim 8. Note that Archambault further discloses a machine-readable medium that provides instructions to be executed by a machine (see column 3, lines 36-40).

With respect to claim 23, see the explanation for claim 9 set forth above.

With respect to claim 24, see the explanation for claim 10 set forth above.

With respect to claim 25, see the explanation for claim 11 set forth above.

With respect to claim 26, see the explanation for claim 12 set forth above.

Conclusion

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Pat. No. 5,896,537 to Landi et al. discloses a system for pointer alias analysis using the notion of partitions. U.S. Pat. No. 6,665,865 to Ruf discloses an optimization technique comprising alias analysis. U.S. Pat. No. 6,031,994 to Radigan discloses a method for determining ambiguous variable definitions such as pointer aliases.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael J. Yigdall whose telephone number is (703) 305-0352. The examiner can normally be reached on Monday through Friday from 8:00am to 4:30pm.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tuan Q. Dam can be reached on (703) 305-4552. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MY

Michael J. Yigdall
Examiner
Art Unit 2122

mjy
March 23, 2004

Anthony Nguyen Ba

**ANTONY NGUYEN-BA
PRIMARY EXAMINER**